FIRE TESTING OF ELECTRICAL CABLES FOR PUBLIC TRANSPORTATION

by

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Extended Abstract

In recent years electrical wire or cable insulation has been, once more, identified by NFPA statistics as a major material first ignited in both residential fires (where it represents 7.6% of fires and 3.9% of fire fatalities, between 1991 and 1995, and the cause of 13% of catastrophic fires, between 1993 and 1996) and transportation fires (where it represents between 11.4 and 25.6% of the first source of ignition between 1993 and 1996, depending on the type of transport, with11.8% for aircraft). This highlights the need for renewed emphasis on fire testing of wires, cables and electrical materials.

Cables can be used for power, for control or for communications; in the case of communications cables, the transmission can be effected by means of metal conductors or optical fibers. With the large increase in communications, the amount of cables used in public transportation is a large, and growing, part of the fuel load, but the fire performance of electric cables has traditionally been based on semi-mandatory guidelines, of relatively low severity. Furthermore, in many vehicles, cables constitute a very large proportion of the combustibles contained in concealed spaces, not easily accessible to passengers.

Recently, the Federal Railroad Administration, the International Maritime Organization, and the US Coast Guard have all investigated requirements for cable fire performance, in order to consider whether changes are needed. The Federal Aviation Administration has now embarked in a project to investigate the fire performance requirements for aircraft electrical wiring.

Cable fire tests can be subdivided into 5 categories:
(a) Old fashioned small scale tests, generally addressing ignitability or flame spread, with results often not predictive of real fire performance;
(b) Vertical cable tray tests, ranging in heat input from 20 kW up to 154 kW, addressing flame spread, and sometimes also smoke and heat release;
(c) The Steiner tunnel test (NFPA 262), assessing wind aided horizontal flame spread, and smoke release, with very high heat input (ca. 90 kW);
(d) Small scale cable tests, often originally designed for materials, measuring fundamental fire properties, such as heat release, critical flux for ignition or flame spread; and
(e) Tests for other cable fire properties, typically smoke: obscuration, toxicity, or corrosivity.

This paper surveys the types of tests available and makes some recommendations for future courses of action.